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PRINCIPLES
OF
SANITARY INSPECTION

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PRINCIPLES
OF
SANITARY INSPECTION.

BY

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PRINCIPLES
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SANITARY INSPECTION.

Sanitary inspection is a comprehensive subject, as it relates to inquiries into all influences affecting or tending to affect injuriously the health of a locality. It involves a knowledge of the importance of perfect purity and cleanliness of air, water, food, and soil, as the fundamental and paramount conditions of health, and seeks to discover and guard against or counteract those influences which are liable to render impure these essentials to the maintenance of healthy life. It is through this important public service that the local health authority is kept informed of those conditions which tend to endanger the health of the inhabitants, and that knowledge is obtained with regard to the sanitary state of the people, and the preventable causes of sickness and death, which forms the basis of all intelligent and efficient sanitary legislation and administration.

Sanitary inspection is not restricted in its objects simply to the collection of information which is indispensable to the application of the provisions of the public health laws; it also includes the execution of

the provisions of such laws whenever the circumstances of the case may justify and require it. An executive service is the natural and necessary complement of an inspection service, inasmuch as the purpose of the latter, in detecting all such influences as are injurious to the public health, is to suggest and make possible the proper steps for their removal.

The causes of disease with which public hygiene is concerned, such as affect the mode of life of masses of population, operate through a great variety of channels, and their discovery and removal require the exercise of knowledge affecting the various conditions under which people live, whether in the city, town, or hamlet. Such knowledge relates to the natural and acquired features of the locality, its meteorological peculiarities, and the social and sanitary state of its population; the character of the soil, ground-water, wells, and springs; the water-supply; plans of drainage and sewerage; the distribution of buildings and of open spaces, whether paved or unpaved; the sanitary arrangements of houses, especially those of the poorer classes; the management of burial-grounds and the arrangements for the burial of the dead; the nature of manufacturing and other industrial establishments; the housing of the poor, and the facilities afforded for bathing, washing, etc.; the conduct of slaughter-houses and all establishments where food-supplies are prepared; the examination of foods with respect to their wholesomeness; the sanitary inspection of schools and school children; the regulations for cleansing the public ways and markets, and for the removal and disposal of domestic and trade refuse; the examination of persons and houses with the object of restrict-

ing or suppressing contagious or infectious diseases of local origin, and of vessels and passenger trains, in order to prevent the introduction of such diseases from without.

While the intelligent exercise of the functions of the sanitary inspector requires a familiarity with these various subjects, a high degree of efficiency is more surely attained by a division of labor according to special branches of inquiry, a plan which yields the advantages of more matured experience and greater precision of knowledge. Besides the ordinary nuisance inspectors and inspectors of quarantine, it is becoming more and more customary to appoint officers fitted for particular lines of work by special education and training. In order to prevent the sale of adulterated and unwholesome foods and drugs, it is necessary to have officers who, in addition to other qualifications, shall possess a knowledge of chemical analysis and microscopical examination. The sanitary inspection of school buildings and the supervision of the health of the children are wisely entrusted to men who have had a medical training. The sanitary supervision of house-drainage and plumbing required under the laws recently established in many American cities, imposes upon the local health boards the duty of employing experts skilled in the technics of this art. The examination of immigrants and travellers, with the object of preventing the introduction and spread of dangerous communicable diseases, is another special branch of sanitary inspection which none but a medical officer is qualified to conduct.

Qualifications of Sanitary Inspectors.—Efficient sanitary inspection depends primarily upon an adequate

knowledge of the various subjects relating to hygiene and public health, and the officers employed in it should be fitted for the work by special and sufficient education. As many of these subjects relate to diseases, their causes, mode of propagation, and the means of their suppression, a medical knowledge becomes an essential qualification of at least a portion of the force employed as sanitary inspectors by a board of health. Under the English health laws the officer of health, whose duties are largely those of an inspecting officer, must be qualified by law to practice medicine or surgery, though such qualification is not made necessary in the case of inspectors of nuisances.

Intelligent sanitary inspection rests upon a knowledge of the following subjects :

1. The principles of chemistry, particularly with regard to the methods of analysis (including microscopical investigation). Such knowledge is indispensable in forming accurate judgment as to impurities of air and water, injurious impregnations of the soil, harmful admixtures in food, and also in the proper use of disinfectants. An acquaintance with chemical physics, including the chief phenomena of light, heat, and electricity, is also advantageous.

2. Natural philosophy, which should embrace a thorough knowledge of the principles of pneumatics, hydrostatics, and hydraulics, with special reference to ventilation, water-supply, drainage, construction of dwellings, and sanitary engineering in general. The laws of natural philosophy will be of great aid in tracing nuisances, in determining questions of ventilation and of overcrowding, and in studying atmospheric changes ; and, in conjunction with chemistry,

will be of the greatest service in the investigation of industries and trades alleged to be prejudicial to health, and in devising measures for the abatement of the evils associated with them.

3. A knowledge of the laws relating to public health.

4. The sanitary construction and arrangements of dwellings, including soil, structure, materials, internal decoration, lighting, ventilation and warming, water-supply, house and soil drainage, and disposal of refuse.

5. A knowledge of the effects of overcrowding, vitiated air, impure water, bad or insufficient food, unhealthy occupations, and of the diseases they produce; the character of nuisances injurious to health, the disposal of sewage, and the effects of soil, season, and climate upon the health of localities.

6. A knowledge of the causes, propagation, and prevention of contagious and infectious diseases. In addition to a familiarity with the above subjects, there should be the further qualifications of methodical and industrious habits, competent powers of observation, sound judgment, and conscientiousness in the investigation and statement of facts.

It may be objected that the qualifications outlined above are too comprehensive, and that the knowledge deemed essential for the performance of the duties of sanitary inspector is such as should only be required of a professional expert. But it should be remembered that sanitary inspection is pre-eminently the service by which information is obtained of the numerous and various conditions which operate against the health of a locality, and constitutes a large and important part

of the work of sanitary government. In order to recognize and intelligently investigate these conditions, and advise as to the means of their amelioration or removal, a comprehensive knowledge of the principles and laws of science involved in their consideration is indispensable. Efficient sanitary inspection requires skilled or expert labor, which can only be secured by special knowledge and experience.

Sanitary Survey.—A systematic sanitary survey of a locality is the true basis of measures for its sanitary improvement. Such a survey embraces an investigation of the natural and artificial or acquired conditions affecting the health of the inhabitants in the district.

The natural conditions affecting the health of a district comprise the geological and topographical characteristics of the locality, the climate, water-supply, etc. The causes of many of the most common diseases arise from conditions connected with the earth's surface and underlying structure, as well as with the soil polluted by the act of man. The influence exerted upon human health by the drainage of a locality, by the moisture in the soil, the ground-water, the telluric emanations, has long been recognized, but the exact effects of these conditions cannot be rightly understood without a knowledge of the physical characteristics of the soil, studied in their relations to the records of diseases in their geographical distribution and local history. These two series of facts, studied side by side, lead to the interpretation of the laws governing the relations of the earth's features to health and disease. Detailed and exact records of the configuration of the earth's surface and its underlying structure,

illustrated so far as possible by means of maps and diagrams, form the basis of correct knowledge of sanitary geography and local hygienic history. It is only by the aid of these facts that the health of a town or district and the records of prevalent diseases can receive their proper explanation.

The influences of climatic conditions upon health are also to be investigated in connection with the natural local conditions. The daily temperature and rainfall, the force and direction of the wind, the barometric pressure, degree of humidity, etc., should be subjects of careful observation and record. In many places these data can now be obtained from the Signal Service Bureau of the Government. In districts where such observations are not recorded, arrangements should be made for obtaining the necessary information. The meteorological fluctuations exert a powerful influence on health and disease, and though they are beyond the control of man, a knowledge of their effects will be most useful in the investigation of other local conditions more amenable to human effort, and in assigning to them their proper share of hurtful influence.

The quantity and quality of the water-supply of a district depend mainly on its geographical and topographical characteristics, which must be studied in their relations to this important fact. The quality of water is necessarily affected by the character of the soil through which it flows and by the surface upon which it is collected. A water may become so thoroughly impregnated with mineral or vegetable matters contained in the soil, or with organic matter upon its surface, as to be unfit for domestic use. A wholesome

water may become polluted by the transmission of impurities through the porous structure of the ground. In locating wells the physical characteristics of the soil should be taken into consideration with reference to the risks of pollution of the supply.

Soil moisture and the state of the ground-water play an important rôle in the causation of disease. These natural characteristics of the soil depend on certain combinations of geological and topographical structure, which must be investigated in every locality before improvements necessary to secure healthfulness can be intelligently undertaken. Before drying and aërating the soil one must have a knowledge of its natural drainage and physical conditions. No plans of artificial drainage or of sewerage can be satisfactorily accomplished without a thorough comprehension of the natural drainage system of the district.

The acquired conditions affecting health relate to the habitations of the population, the water-supply, the drainage and sewerage, removal of refuse matters, public ways and places, gas and lighting, slaughter-houses and abattoirs, markets, food-supplies, manufactures and trades, public school buildings, hospitals and public charities, police and prisons, fire establishments, cemeteries and burial, the arrest of contagious and infectious diseases, etc. A series of questions upon these and other subjects relating to municipal sanitation have been framed by the National Board of Health to serve as a guide in making a systematic sanitary survey of a district, and their practical use is exemplified by surveys taken of several cities and detailed in the reports of that Board for the year 1879, to which reference should be made. The annual volumes of

the American Public Health Association also contain valuable information upon the same subject.

Sanitary Inspection of Habitations.—The health authority should, so far as practicable, have a full knowledge of the general sanitary condition of every house in the district which it controls. The acquisition of such information is of necessity a laborious undertaking, requiring painstaking and systematic search, and a considerable outlay of money; but when the record of facts is once completed its benefits will be continuous. A brief description of every house, showing the structure of the building, the facilities for ventilation, the drainage arrangements, its connection with the sewer, the nature of the water-supply, the conditions of the soil, health of occupants, number and causes of deaths that have occurred in it, and other pertinent information, should form a permanent record, and this record should be kept up by recording any changes noted upon subsequent examination. The complete sanitary history of every locality thus obtained will be useful for reference, and will serve as a guide to the discovery of unhealthy premises and the causes of their insanitary conditions, and lead to the employment of measures of improvement. By reference to the records the condition of each house at once becomes known, and the effort to determine the exciting cause of any disease therein existing will be greatly facilitated.

It is the right of every one proposing to buy or rent a house to have a knowledge of its sanitary history. Such information is generally obtained with the greatest difficulty, because no sanitary survey has ever been made. With this as a basis the local sanitary authority

ought to be able, for a small fee, to furnish to any one proposing to occupy a house a copy of the health history of the house, certified from the records.

The tabulated forms to be used for a sanitary inspection of houses will vary slightly according as the district is urban or rural. The form presented below is a modification of the schedule of questions proposed and used by the National Board of Health, as the basis of reports upon the sanitary condition of a place. The headings should be printed in tabular form, on paper of convenient size and shape, arranged in the style of a tablet.

SANITARY INSPECTION OF HOUSES AND PREMISES.

Number of Inspection Return..... Date of inspection.....

1. Ward....., Street....., No.....
2. Names of occupier and of owner.....
3. Area of lot.....; of house.....; of outhouses.....
4. Site of house, wet or dry.....
5. Age of house.....; material; number of stories.....
6. Number of living-rooms.....; of sleeping-rooms.....
7. Cellars and basement.....
8. Sinks, drains, and cesspools.....
9. Privies or water-closets, location and condition.....
10. Yards.....
11. Hogs or other animals.....; fowls.....; number.....; where kept
12. Public nuisances on or near premises.....
13. Number of families in house.....; names of heads of families.....; number of persons in each family, specifying number of whites and blacks; total number of occupants.....
14. Sicknes now in house.....; what diseases.....
15. Sicknes during past year.....; what diseases.....; number of cases.....
16. Deaths during past year.....; what diseases.....
17. Persons vaccinated; persons not vaccinated.....
18. Water supply, whence derived, sources of contamination.....
19. Sanitary needs and estimated cost.....
20. Additional observations

.....Certified as correct,

.....

Inspector.

Upon the other side of the blank may be printed directions for the guidance of the inspector.

Directions: 1 and 2. Give the exact and full name of the owner and occupier of the premises. Give the street and number, and describe the location so that it cannot be mistaken.

3. Give dimensions of sheds, privies, stables, etc., with their relations to living-rooms.

4. State whether site is above, below, or upon same level as adjoining land. Conditions of the soil, whether damp, wet, or dry or "made-ground."

6. Note how ventilation is secured.

7. Examine cellars very carefully, and describe their condition, particularly with regard to dampness, amount and kind of filth, ventilation, drains, etc. State whether used for living purposes.

8. Is there any offensive smell from the sinks? Are the drains water-tight, clogged, or uncovered? Are there any traps to prevent drain-air from coming into the rooms? Are there sewer-connections, intercepting-trap, soil-pipe ventilation? Are the cesspools tightly covered, clean, and ventilated? Do the cesspools leak into the cellar or into the well?

9. Privies and vaults. Describe their condition particularly. Are they full, foul, leaky, or overflowing? Are they shallow or deep, water-tight or leaking, connected with the sewer, trapped, ventilated, etc.

10. Describe the kind and amount of all heaps of filth about the premises, and the general condition of the yard, area, etc.

12. Public nuisances, as sewers, badly paved and drained streets, gutters, etc., stables, manufactories.

13. Note overcrowding and social condition of the inmates.

14, 15, 16, and 17. Inquire particularly.

18. State whether, in addition to the supply from the public water mains, water is used from a well or cistern; whether it is called good or bad; whether any filth probably drains into the well.

19. State what is necessary to be done to remove nuisances and improve the sanitary condition of the premises, and the approximate cost of such improvements.

The duty of collecting information upon the subjects embraced in a sanitary inspection should be performed with great discretion, so that, while nothing necessary to be known shall escape observation, the service shall not excite opposition by its obtrusiveness and unnecessarily inquisitorial character. It must be remembered that in most cases these examinations can only be carried out by the sufferance of the people; but by tact

and politeness it is possible in nearly all instances to obtain all the information desired.

Upon the completion of a general house-to-house inspection, the returns—containing a record of sanitary facts—should be tabulated, paged, indexed, and grouped by wards or districts in such a manner as to make instant reference to the original inspection of every house and locality possible. From these data sanitary ward maps may be compiled, indicating by color the special insanitary features of a district; as, for example, insufficient or defective drainage, polluted or suspicious water-supply, unhealthy habitations, public nuisances, centres of excessive mortality, prevalence of epidemic diseases, etc., these subjects being so arranged that ready reference can be made to the original records of inspection for a full description and sanitary history of any house or locality.

The frequency with which a systematic inspection of a district should be made must necessarily vary according to the extent and character of the district and other circumstances. It would be a useless task and a waste of time and money to inspect localities containing the best residences and a population of the better class, as frequently as streets and houses in poor neighborhoods, particularly such districts as are notoriously unhealthy. The latter, of course, will require most vigilant watching. At the same time, no part of a town, however favorable its sanitary reputation, should be exempt from periodical visits, as it is only by unrestricted and rigid scrutiny that a full record of facts favorable or otherwise to the public health can be satisfactorily obtained. Whenever made, these inspections should be thorough and systematic, so that the

data secured shall represent the actual state of every part of the district.

Sanitary Inspection of the Water-supply.—An abundant supply of wholesome water is an essential to the health and comfort of man. An insufficient quantity leads to impurities of all kinds, and an impure quality is a frequent cause of disease. Experience has taught us that a community will be unhealthy in proportion as the supply of water is scanty and the quality bad, other things, of course, being equal. In providing a supply, it is to be presumed that the water commissioners have given due consideration to the quality of the water, the quantity required, and the risks of pollution, both as regards the source of supply and the mode of distribution. But this fact does not relieve the health authorities from the duty of vigilant inspection of the source, storage, and distribution of the water used for domestic purposes, in order to discover any permanent, temporary, or accidental cause of contamination. It is pertinent to such an inquiry to ascertain all facts connected with the source from which the supply is derived. If from a river or stream, whether the drainage from towns, villages, and factories, or other polluting matters flow into it above the point at which the water is taken; whether the gathering grounds are cultivated lands, enriched with night-soil or other excrement, and whether the territory from which the water is drained is sufficiently populated to seriously affect the quality of the latter; whether the supply is ample for general and domestic purposes, and is distributed to every house; whether impurities of storage are carefully guarded against, and the processes of filtration and purification are successfully

conducted; whether the channels of distribution are protected from all risk of pollution, and whether the supply is always constant and the pressure in the mains sufficiently strong to insure delivery at the top of the house, if necessary, and also to prevent regurgitation.

These and other questions relating to the character of the supply should not be overlooked, but the services of the sanitary inspector will be more constantly required in searching for the sources of pollution to which water may be exposed after it has been brought into the town and into the houses. It will be necessary to inquire into the situation, construction, and condition of cisterns and tanks, the means of separation of cisterns used for domestic supply from those supplying water for the closets, the situation of the overflow-pipes, and the relation between the service-pipes and the water-closets, the object being the prevention of any influx of foul air or foul matter into the service pipes, and the consequent contamination of the supply.

The color, taste, and smell of water will generally indicate the presence of impurity, but if this evidence is not satisfactory, more exact information should be obtained by chemical analysis. The inspector should not be required to make such an analysis, but he can carefully procure samples of the water to be submitted to a chemist who is expert in this branch of investigation.

In rural districts and in towns where the supply is collected or obtained on the premises, it is important that the state of every well and other source of water used by the inhabitants should be fully known. Rain-

water stored in cisterns and well-water are liable to contamination from many sources. If the collecting surface is defiled, impurities will be washed into the cistern by the first fall of rain. Rain-water collected in the neighborhood of inhabited places is liable to contain gaseous and solid impurities washed from the air. Inspection should be made, from time to time, of the interior of cisterns, in order to see that impurities are not collecting, that no leaks exist, and that the overflow-pipes are properly arranged. A leaky condition of a cistern may lead to contamination of the water by influx of deleterious matter from the soil, aided by a favorable position of the surrounding ground. Rain-water may take up lead from the lining of the cistern and from lead pipes, and zinc from zinc roofs.

The situation and construction of wells, with reference to their liability to contamination from surface washings, ooziings from drains or cesspools, and other sources of filth, will require the most careful investigation. Whenever cesspools or drains, whether open or closed, or accumulations of filth, are near a well and the soil about it is wet and filth-sodden, there will be a presumption of contamination. When suspicions arise, samples of the water should be taken for examination. Under certain circumstances, however, the evidence may be such as to warrant the closing, cleansing, or repairing of wells without resort to proof of impurity by chemical examination. When well-water is used it is advisable to inquire into the condition of the soil, which more or less influences the quality of the ground-water from which shallow wells are supplied. In districts where the soil is made use of as a reservoir for excremental matters deposited in cesspools

and privy-vaults, or is exposed to defilement by leakage from disjointed or broken drains, badly constructed sewers, or leaky gas mains, or where filth is stored upon the surface of the ground, the entire water-bearing stratum in time becomes polluted, and the water of wells is rendered impure. On this account surface and shallow-well waters in thickly populated places are always to be regarded with the greatest suspicion. Shallow wells, even in rural districts, are often horribly polluted by sewage, and by animal matter of the most disgusting origin.

Public drinking-fountains should not escape notice, as they are sometimes improperly arranged, as, for example, in connection with drinking-troughs for horses. Cisterns for the public supply of ice-water may be permitted to become unclean by the accumulation of deposits, or the water may be rendered unwholesome by the injudicious use of impure ice.

Public baths should be kept under strict sanitary supervision. Not only should the supply of water be maintained in a fresh and clean condition, but the regulations prescribing the proper use of the baths should be rigorously enforced.

Sanitary Inspection of Drainage and Sewerage.—The drainage and sewerage of a town bear important relations to the public health, and therefore properly come under the notice of the sanitary inspector. Nuisances arising from insufficient surface drainage, from dampness of the sites of habitations, and from badly planned and managed sewerage-works, frequently engage the attention of the health officials. It may not devolve upon these officers to suggest special schemes for the construction and improvement

of public works, but it is a part of their duties to notice gross defects so far as they tend to exert an injurious influence upon the public health, and to urge the adoption of means for their remedy.

It may be necessary in some localities to have a system of deep drainage to facilitate the movements of the ground-water, and thus make both air and ground drier. A moist soil exerts an injurious influence upon health, it having been shown upon reliable evidence to be favorable to the production of lung diseases, rheumatic and catarrhal affections, and to be connected in some way with the development of typhoid fever and cholera. The drainage of swamps, areas of made-land, and places saturated with water, near or in inhabited districts, will be followed by the best results to the public health.

Surface drainage should be free and unobstructed, so as to promptly carry off the greatest amount of rainfall, and prevent the overflow of cellars or the intrusion of soil-water.

Nuisances are often caused by the disposal of slop-waters upon the surface of the ground or by wayside channels. Slop-waters or house-waters are in fact a condensed form of sewage, as they contain not only the cooking-water and water used for washing the person, clothing, and house, but almost invariably some portion of urine. Such matter is not fit to be discharged over the surface of the ground, as it must of necessity become offensive and cause a nuisance by decomposition and soakage into the soil. If it cannot be disposed of upon the premises, it must be carried from the house in pipes to a proper outfall.

Sooner or later, every town must be provided with

a system of sewers to prevent the collection of filth in and about habitations and frequented places, and to protect the air and soil from pollution. While aiming to carry out this object, the sewers themselves must not be permitted to become reservoirs of filth, which, by stagnation and decomposition, may give rise to a nuisance only less offensive and dangerous than that which they are intended to prevent. It is essential that sewers shall be well constructed, and permit of a rapid, continuous, and complete flow of the sewage to the outfall without leakage by the way. They should allow no deposit to take place, and should be thoroughly ventilated. With these conditions maintained, it is scarcely possible for a sewer to become offensive or in any way dangerous to the public health. Ventilation may be effected by having numerous openings into the streets, protected by gratings, and by leaving the sewer-inlets untrapped. In this way a free interchange between the sewer-air and the atmosphere is secured. The openings will relieve pressure upon the house-drains, and if the latter should be left unguarded, the danger from the admission of sewer-air will be greatly diminished by the free dilution of the sewer-air with atmospheric air.

The escape of evil odors from untrapped sewer-inlets is not a valid objection to the disuse of the trap, but rather an indication that the sewer does not properly perform its mission, which should lead to the remedy of the fault and not to its concealment. With the conditions giving rise to the nuisance unremedied, it is far safer to permit the escape of sewer-air upon the streets than to subject the inhabitants of houses having connection with the sewer to risk by closing the

manholes and using traps upon the inlets, and thus increasing pressure and preventing the diluting effect of the outside air.

Extrinsic flushing will be required when the force of the current of sewage is not sufficient to produce a scouring effect. The cleansing and disinfection of sewers are occasionally required to improve their condition, but at best they are only temporary expedients. Sewers which accumulate deposits and are commonly foul, and which constantly require cleaning out and disinfection, are radically wrong in construction and should be reconstructed without delay.

When sewers are properly constructed and managed and have free ventilation, the air which they contain differs but slightly from the outside air; but as these conditions cannot always be insured, it is a wise plan to have the house-drain disconnected from the sewer by means of an efficient trap, and the system of house-pipes thoroughly ventilated. The disposal of sewage should take place without causing a nuisance in relation either to air or to water. This is a subject of serious consideration in the planning and management of the outfalls of sewers. The sewage of a town should never be discharged into a stream at or near a point from which the water-supply is obtained, or which, from its small volume of water, is incapable of diluting the liquid refuse sufficiently to prevent serious pollution, without first undergoing a proper degree of purification. Purification of sewer-water may be effected by precipitation at the outfall by chemical agents, by irrigation, and by intermittent filtration. If properly managed, any one of these methods may be applied with satisfactory results.

In small towns and villages it may not be practicable to provide a general system of sewers, and hence the disposal of refuse matters, such as excreta and house-waters, must be effected by other methods. As the choice of these plans is more or less directly under the control of the householder, being only exceptionally restricted by local regulations, a variety of methods will be encountered in every locality, including even the large cities. For the disposal of excreta the cess-pool or privy-vault, or some one of the dry methods, is resorted to; but the house-slops are not so readily gotten rid of. In towns the open gutter is commonly used for this object, while in villages and in the country the slops are thrown upon the ground. These plans for disposing of refuse matters are everywhere among the chief sources of nuisances, and will constantly claim the attention of the inspector.

Privies of the accumulative sort, with their respective soakings and exhalations, whereby air, soil, and water are polluted, are a very common means of spreading some of the most fatal of diseases, of which typhoid fever may be taken as a type. The utmost watchfulness should be exercised to reduce these nuisances, which exist in all populous places throughout the country, to the lowest degree of dangerousness. Privy-pits and cesspools, if at all permitted, should be made to conform to the most stringent regulations both as to their construction and management. They should not be located too near the house or the water-well; they should be constructed of unabsorbent materials, and should be perfectly water-tight, so as to prevent the leakage of filth into the soil, building, or water; they should be of small capacity, so as to pre-

clude the accumulation of matter, and they should be regularly and methodically cleaned at short intervals, so as not to allow the putrefaction of excrement. Their use should not be permitted for anything but excreta.

To meet sanitary requirements, improved systems have been devised to take the place of the filthy storage-pits, so universally condemned. These are principally the pail-system and the so-called dry systems. The simple pail-system, much used in England, but not yet systematically adopted in the United States, consists in the removal of excremental matter at short intervals, before it has become offensive. As a means to this end, movable receptacles are used which systematically, at short intervals, are to be changed, clean for the dirty, by the scavenger; and which, in order to prevent offence in this process, are provided with tight-fitting lids to be applied to the foul pails under removal. The excrement is removed daily without admixture, except with the ordinary kitchen refuse, and is transported outside the town.

The dry system is adapted to towns and villages and to single cottages. It consists in the admixture of dried earth, coal ashes, or other dried refuse, with the excrement in sufficient quantity to absorb and reduce it to an inodorous form. All slops and sink-water and other extraneous matter must be carefully excluded. The receptacles should be made of impervious materials, and the closet should be located either out-of-doors, or in an isolated part of the building, or in an apartment projecting from the house, where the necessary ventilation can be secured. The dry systems form a convenient, economical, and efficient substitute for water-closets where the latter cannot be made use of,

but they must be vigilantly superintended, and in some cases actually managed by the local authority.

It is essential that privies of all kinds, particularly those located in poor neighborhoods, shall be under constant supervision, in order to prevent the violation of the laws and regulations pertaining to their construction and management. This supervision should not be confined to the privy contrivances and the methods of their cleansing, but should also extend to the ultimate disposal of the matter, which is a most important part of the management of refuse removal.

Nuisances incident to the improper disposal of liquid house-wastes are of frequent occurrence. In towns and villages, the house-slops are either thrown upon the ground near the house, where they are partly absorbed and in time load the soil with impurities; or they are carried away in open or in closed channels to some distant part of the premises, where they gradually soak into the ground; or they are discharged into the roadside or street-gutter, causing a nuisance of a most offensive character. Sometimes the entire sewage of the house is collected in cesspools provided with porous walls, with the object of allowing the fluid parts to drain away, the solid matter being removed only after long accumulation. In the absence of sewers, these nuisances may be avoided by providing tight cesspools with sufficient capacity for one or two days' collection, from which the sewage may be distributed to the land near by through pipes under the surface of the ground. This is the plan of subirrigation, which is very convenient for the disposal of the sewage of separate houses or groups of houses, where land is available.

Subsurface irrigation may be used for the disposal of slops alone, or for slops mixed with the efflux of water-closets. It is necessary, however, to provide a means for intercepting all solid and fatty matters, which should not be discharged into the drain-tiles, as they would in time clog up the pipes and render the system inoperative. Solid excrement may be disposed of in a cleanly and inodorous manner by the use of the earth-closet, only the slop-water being allowed to flow away in the subsoil drains.

The success of this plan depends on the property of the soil of destroying organic matter, by the aid of the oxygen contained in its pores, and, to some extent, upon the action of the rootlets of grass and plants. The supply must be intermittent, and in order to secure this action a flush-tank is provided, which automatically discharges its contents through all the ramifications of the drain-tiles. When water-closet wastes are disposed of at the same time, an intercepting chamber should be placed between the house and the tank to collect the solid matter, which should be removed at frequent intervals and applied to the land.

The occupants of rural premises will generally be able to satisfactorily dispose of their refuse matters upon their own grounds, without any detriment to themselves or to their neighbors. But when human beings are gathered together on small areas, the disposal of refuse cannot be secured without method. The obligation to designate the correct system of disposal and to supervise its management, so that no avoidable nuisance shall be created, rests upon the sanitary authority.

Frequent inspections will be required in order to

prevent nuisances which arise through neglect in the disposal of dry house-refuse, such as ashes, dust, and garbage, and through improper disposal of trade-refuse and the refuse of domestic animals. Provision must be made for the frequent and regular removal of these matters, and, at the same time, regulations must be enforced which shall prescribe that house-refuse, while awaiting removal, shall be so cared for and managed as not to cause a nuisance on the premises. Every facility should be afforded the householder for promptly getting rid of his refuse, so that no excuse can be offered for the accumulation of offensive matters upon his premises.

Faults in house-drainage and plumbing are a frequent and formidable danger to the public health. Until within recent years, this fact has been very imperfectly recognized by architects and builders, and by the public generally, and too much trust has been placed in artisans, who have been permitted to proceed in their work without any carefully wrought plan or expert supervision, and also without their qualifications first having been thoroughly ascertained. As a result of various deficiencies, and prominently that of neglect of competent sanitary supervision, it frequently happens that the evils a modern system of house-drainage is intended to avert, are made worse by careless planning and execution of the drainage arrangements within the dwelling. Owing to the absence of skilled guidance, and frequently through want of conscientious execution, defects in house-drainage of the most flagrant character are constantly encountered, even in the better class of houses. But a greater familiarity on the part of the public with the correct principles

of house-drainage, and supervision of the work by boards of health, will tend to lessen abuses, which are responsible for a large quantity of preventable disease. In many places laws regulating house-drainage have been enacted, and entrusted for their execution to the local sanitary authority. Under these laws, rules and regulations are prescribed for the registration of plumbers and for the guidance of artisans in drawing their plans and specifications. In large cities the plans, when approved, are executed under the supervision of trained officers especially appointed for the purpose; but in small towns the work of supervision may be advantageously combined with the duties of general sanitary inspector. The laws and regulations in force in Boston, New York, Philadelphia, and Washington may be cited as examples of the methods adopted for conducting this important branch of house sanitation. The object of these laws is to place the drainage arrangements of houses under skilled surveillance, so that their planning, construction, and management shall conform to standard principles.

The essential conditions of house-drainage are : That the receptacles shall be constructed of such material and in such manner as to be impervious to fluids, and easily permit of cleansing and of being kept clean in all their parts. That the pipes and drains shall be of sound and durable material, and so constructed and laid as to be gas-tight throughout, and to secure a continuous and complete removal of whatever enters them without leakage by the way, or without the formation of deposits or incrustations. That the system shall be so planned and arranged that neither the air of the house nor the drinking-water can in any

wise be polluted by the escape into the house of air from the sewer or from the drain. Upon these fundamental principles are based the rules and regulations governing the technics of construction, which should be formulated for the guidance of the architect, builder, and artisan. The law should require that the plans and specifications of the drainage arrangements of every proposed dwelling, and of old houses undergoing alterations, should be submitted for approval to a competent official or board of experts, and that the essential details of such plans should be carried out under skilled supervision. The effect of such a requirement would be to avoid errors in design and construction in new buildings, and to gradually improve the drainage arrangements of old structures.

As the best systems of house-drainage are liable to derangement which may escape the notice of the householder, provision should also be made for the periodical inspection of the drainage-works of every dwelling, in order to guard the occupants against the evil consequences of deficiencies of which they may have no knowledge.

In many places no systematic regulation and supervision of house-drainage is ever attempted, the authorities having to depend for knowledge of existing defects upon complaints made in special cases, upon the results of investigation of the localized causes of disease, or upon discoveries made during a casual house-inspection. This information relates to a small number of the actual defects, the greater number escaping detection in the absence of methodical inquiry. Where no such laws exist, the sanitary authorities may do much toward effecting a reform in the present

objectionable methods by adopting and promulgating regulations similar to those in force in cities already mentioned, for public information, for the instruction of their inspectors, and to serve as a guide in all work which they are called upon to perform. Thousands of houses are annually built in a manner dangerous to the health of the occupants, because the builders are ignorant of the conditions to be observed to make them healthy, and they fall into the errors which might have been avoided had they the knowledge of the correct principles of construction, or had the authorities required their application.

Sanitary Inspection of Public Ways and Places.—The sanitary importance of thorough cleanliness of public ways and places cannot be over-estimated. The deposit and retention of refuse matters upon the surface of streets may give rise to dangerous pollution of air and soil. This is apparent when the composition of the filth of badly-kept streets is inquired into. In addition to the inorganic detritus of the road, it consists of the dung and urine of horses, and sometimes of other animals, of vegetable matter from trees, of refuse from houses—kitchen garbage and house-slops—containing animal and vegetable matter, and, in poor neighborhoods, there is sometimes an admixture of human excrement, both solid and liquid. This heterogeneous mixture of animal and vegetable substances, when converted into dust, fills the atmosphere with noisome particles, or when wetted by rain and exposed to heat, soon decomposes and develops effluvia which must be detrimental to health, especially in crowded and ill-ventilated localities. Unless the pavement is composed of impervious materials, liquid matters upon

its surface will penetrate and pollute the soil. These results are due to imperfect drainage, to a bad system of scavenging and refuse-removal, and very materially to badly constructed pavements.

Surface cleansing cannot be made efficient without the provision of suitable pavements—such as will prevent the retention of filth and its imbibition by the soil. It is especially important that this provision should be extended to all small streets, courts, and alleyways, and to the surface areas in all crowded and badly ventilated places, as in such localities the open spaces are likely to be used as common depositories for all kinds of refuse matter, including human excrement.

The construction of public roadways and the conservancy of the surface area of towns are commonly entrusted to a commission or board of public works, but the delegation of these powers to a co-ordinate branch of government does not relieve the sanitary authorities of the duty of closely scrutinizing the work, and noting deficiencies which tend to injure the public health, and of urging the proper remedies.

Under certain circumstances the application of disinfectants to the street surface and gutters will be required, but this precaution will rarely be necessary when proper care is exercised in the construction and cleansing of the pavements. The utmost care will be required in preventing public urinals from becoming nuisances of an offensive character. These conveniences should be washed out daily, and otherwise carefully managed under the vigilant eye of an inspector.

Sanitary Inspection of Gas and Lighting.—The relation of gas and lighting to the public health is

a subject demanding careful investigation. Adequate lighting of the public streets and places is not only essential to public convenience and order, but is a means of restraining the perpetration of nuisances which are apt to be committed under the protection of darkness. Gas should be maintained of a specific illuminating power and purity. Impurities in gas not only diminish its illuminating power, but tend to injure health by deteriorating the air in the rooms where it is used. The escape of gas from defective joints, or from flaws in the street pipes, has often been attended with disastrous results. The escaping gas may pass through the foundations of houses and poison the air within. This accident is not uncommon in the winter season, when the air in the ground surrounding the house is apt to be drawn into the basement by the aspirating power of the heated air within the building. Gas may also prove injurious by fouling the water of wells. Another danger is from explosion in sewers, and in cellars and cesspools connected with sewers by drains, the gas escaping into the sewers and thence being conveyed upon private premises through badly constructed house-drains and untrapped inlets.

The location of gas-works, with respect to the influence on the health of the neighborhood of vapors escaping during the process of gas-production, and also with respect to the manner of disposal of refuse matters from gas-working, will occasionally require a careful investigation.

The sale of illuminating oils should be restricted to such qualities as are known to be free from explosive-ness. The law should make provision for ascertaining the grade of petroleum exposed for sale, and should

prohibit the sale of this article at retail when its "flashing-point" is below 100° F. The routine work of testing oils and burning fluids is properly delegated to special officers, but the sanitary government should interest itself in procuring the adoption of laws which will avert accidents and prevent the loss of life.

Sanitary Inspection of Slaughter-houses and Abattoirs.—By mismanagement slaughter-houses may become a nuisance to the neighborhood, or their condition may be such as to affect the wholesomeness of the meat prepared for the market. Wherever located these establishments will always require careful supervision, as from the nature of the business nuisances are readily created by putrescent effluvia, or by filthy soakage or outflow. Particular attention should be directed to the location and construction of the buildings, to the means of water-supply, drainage, and ventilation, to the provision of suitable receptacles for the refuse and its prompt removal, to the means of preventing filthy soakage of liquid refuse within or about the buildings, and to the maintenance of cleanliness throughout the establishment and in every process of the business. By-laws prescribing rules embodying these essential points should be adopted, and their observance enforced by vigilant inspection.

Slaughtering is most commonly done in private establishments, which are seldom constructed, equipped, or managed in strict conformity to sanitary principles. Many of these establishments are extemporized out of buildings constructed for other purposes, and are totally unsuited for the slaughtering of cattle. As they are generally located in densely populated parts of the town, their deficiencies and mismanagement have the

widest scope for exerting a pernicious influence. By placing these establishments under the control of the board of health, and requiring a permit to engage in the business, conditioned upon proper location and construction of buildings and good management, a great reform can be effected in a business which is too often conducted in a slovenly manner, to the detriment of the public health.

The concentration of the business of slaughtering cattle in well-appointed and well-conducted public slaughter-houses, or abattoirs, where abundant water, good drainage, thorough ventilation, ample means of cleanliness, and perfect facilities for the work are provided, and where every branch of the business is conducted under constant official observation, is strongly to be advised, as a measure highly advantageous in its economic and hygienic results. The adoption of this practice is gradually being extended as its benefits become understood and appreciated.

The fact that typhoid fever, scarlet fever, and some other diseases have been spread through the agency of milk, makes it imperative that cow-houses, dairies, and milk depots should be managed under the provisions of salutary laws and systematically inspected, in order to insure the enforcement of such provisions.

Sanitary Inspection of Markets.—All markets should be placed under the control of the sanitary government. The construction and management of the buildings should be such as to insure ample light, free ventilation, perfect drainage, prompt removal of refuse matters, and thorough cleanliness. Supervision should also be extended to the immediate neighbor-

hood, including the streets and passage-ways, with the view of preventing any avoidable nuisance. The provision of smooth and impervious pavements is necessary, in order to facilitate cleansing and prevent the retention and imbibition of filth.

Sanitary Inspection of Food Supplies.—The supervision of the food supplies of the people is one of the most important obligations of a municipality. While the price and the quality, in a measure, must be left to the ordinary operations of trade, the law must take cognizance of and prevent adulterations, and the manufacture and sale of any articles intended for human consumption that are injurious to health. In order to effect this object the law should clearly define the offence of adulteration in all its various forms, and also designate the kind of food which is unwholesome and the circumstances which render it so, and direct the course to be pursued in condemning, and withdrawing from the market, and disposing of, any diseased, or unsound, or unwholesome food, or food unfit for the use of man. It should also embrace provisions for its own thorough and complete execution.

The organization necessary for carrying into effect such regulations, as well as many other important measures connected with the preservation of the public health, already exists in many States in the form of a State board of health. Vesting such authority in a central board should not abrogate nor conflict with the regulations of local boards for the inspection of food-supplies, such as meat, fish, game, vegetables, and other perishable articles which require daily supervision; but, on the contrary, would furnish a means of co-operation in effecting a common purpose.

While the main object of legislation against adulteration is the protection of the public health, it yields a further advantage by its economic results. This fact is prominently displayed under the operations of the Massachusetts food-inspection law. Of articles liable to adulteration, such as milk, butter, spices, vinegar, cream of tartar, and some drugs, consumed in that State in 1884, of the value of \$15,000,000, five per cent., or \$750,000 were saved to consumers through the services of inspectors of food.

Most European countries are well provided with laws, both general and municipal, for regulating the manufacture and sale of articles of food, but, beyond enacting a law prohibiting the importation of damaged and adulterated tea, and regulating the sale of oleo-margarine, the United States Government has done little to insure the purity of food. Most of the States have statutes relating to special articles of food, some of which have a purely commercial object, while others are intended for the protection of the public health. Massachusetts, New York, and New Jersey have recently adopted stringent measures for the prevention of the sophistication of food and drugs, which have already been productive of good results. These laws have been ingrafted upon those of the State boards of health. One of their objects is the protection of trade by preventing falsifications which may or may not be injurious to health; but the vital purpose is to take cognizance of adulterations which are deleterious, and to prevent the sale of such articles of food.

Violations of the law are detected by the employment of inspectors and analysts, and its provisions enforced by notification and warnings, or by prosecu-

tion and penalties, and in some cases by the confiscation of the condemned articles. The same officer may act in the dual capacity of inspector and analyst.

In order to promote the objects of food-inspection public test-offices, properly equipped with all necessary appliances, should be opened for the examination of all articles submitted by the inspectors, and also by the people. Such an office has been established in Paris, where all articles of food, beverages, etc., are analyzed and tested by experts, who also perform the duties of inspectors of markets and among the tradesmen. For a nominal sum, and in some cases gratuitously, any one can ascertain the composition of any suspected article of food. Articles of domestic use, clothing, colored toys, wall-papers, etc., are also examined in order to detect any poisonous ingredients that may be present.

Adulteration has been detected in a great variety of foods, vegetables, beverages, and drugs; but the practice is common only in a limited number of articles. The principal articles liable to adulteration are milk, butter, cheese, spices, vinegar, sugar, ground coffee, tea, oils for consumption, cream of tartar, spirits, and various sorts of drugs; and to these special attention should be directed.

The examination of meats, fruits, and vegetables, and other perishable articles, should be made with great frequency, as the stock is ever changing.

Animals should be examined immediately before killing, and again before the meat is exposed for sale. The concentration of the business of slaughtering in public slaughter-houses, or abattoirs, will make efficient inspection practicable.

In order to facilitate the labors of the inspector, the law should describe the kind of food which is unwholesome, or the circumstances which render it so; but with the best care as to details, much will have to be left to the discretion of the officer who makes the examination. Study and practice will enable him to successfully discriminate in most cases coming under his observation. Occasionally it will be necessary to refer suspicious articles to the public analyst for the application of chemical or microscopical tests.

It is the practice, in the city of London, to condemn the flesh of animals infected with certain parasites, as *trichina* in pork, the *cysticerci* in pork, beef, and mutton, and *flukes*, which infest the livers of animals; and of animals suffering from fever or acute inflammatory diseases, as rinderpest, pleuro-pneumonia, and the fever of parturition; and of animals wasted by lingering sickness, such as phthisis; and of animals which have died from accident or from natural causes; and also all meat that is tainted with physic, or that is sufficiently decomposed to be discolored or have a putrid smell.

The flesh of animals which have been exhausted, excited, or tortured before death, has frequently proved to be unwholesome.

Since 1887. it has been the practice in Berlin to require all fresh meat not slaughtered in the public abattoir also to be subjected to official inspection before being permitted to be sold. There were erected for this service seven inspection stations, all close to the main thoroughfares, or near the market places. The one in the central market place is always open, but the hours for the others vary according to the

work. The staff of inspectors consists of 116 persons, and these, on Tuesdays and Fridays, are supplemented by 40 to 50 meat inspectors and veterinary surgeons.

Each station consists of an office, two adjoining rooms, one for microscopical and one for macroscopical examinations, and an observation room for the meat. The chief of the station is a veterinary surgeon. As soon as the meat is brought to the station it is subjected to a rigid examination, and stamped by one of the officials, according to its condition. It is then either taken away at once by the butcher, or kept for further examination, or the police are communicated with and the meat detained. Every butcher obtains a printed form stating the kind of meat examined for him at the station. All lymphatic glands are especially examined for signs of tuberculosis or pneumonia, and in cases of doubt the meat is detained until it can be proved to be satisfactory.

All meat brought for inspection must be taken from animals which, before being slaughtered, have undergone examination, and been certified as not suffering from disease, and this certificate is kept at the inspection station. These certificates are not always given by veterinary surgeons, as all that is necessary is that the animals shall be examined by trustworthy persons acquainted with the signs of health and disease in animals.

The greatest watchfulness is needed to prevent meat being sold as inspected meat before it has been examined, and to insure that all fresh meat does really come to the station as soon as it arrives in Berlin. In these matters the police and railroad officials are of great service. At times evasion of the regulations

takes place, but it is almost impossible to prevent it in a large commercial city. Very much, however, has been done to make it reasonably certain that all the stalls and shops of the principal butchers contain only inspected meat, and it is expected later to control all meat which is prepared in hotels and eating-houses, and even to secure the inspection of all materials used for such food as sausages, preserved meats, and ham. Until these regulations are enforced, meat which is diseased will be used for such purposes without it being possible to prevent it.

During one year the total number of animals examined was 91,610 sheep, 99,691 pigs, 143,955 calves, and 103,359 quarters of beef. Of the meat rejected and handed over to the police as unfit for food, very much contained tubercle; trichinæ, and measles were present in the pork eighteen and seventy-eight times, respectively; while in more than 1,000 calves the meat was too watery to be fit for food. Echinococci and thread-worms were found in some of the meat, and a great deal that was brought to the station was detained because it had become decomposed. In thirty cases the officials detected meat exposed for sale that had not been inspected, or that had already been confiscated by the police.

Sausages are liable to become poisonous on account of a modified putrefaction which occurs in this variety of food when kept for a length of time. The poisonous effects have generally been traced to sausages which are mouldy and soft in the interior, and which emit a strong smelling odor. Other kinds of animal food, when in a decayed or mouldy condition, may occasionally produce similar results.

Fish, poultry, and game must be examined for signs of decomposition.

Fruit and vegetables must be objected to mainly on account of advanced decomposition. Mouldy food of all kinds is dangerous, and should be condemned.

The testing of canned goods for poisonous substances, and the examination of milk, butter, cheese, coffee, tea, sugar, cocoa, flour, bread, vinegar, drugs, etc., is mostly work to be performed in the laboratory, the duty of the inspector being chiefly confined to procuring samples of suspected articles for analysis.

The officers selected for the responsible service of food-inspection should possess special attainments and undoubted honesty, and in order to secure proficiency they should be required to devote their entire time and energies to the work.

Sanitary Inspection of Manufactures and Trades.
—Noxious or offensive trades and manufactures require supervision, in order to protect the health of employees and prevent the processes from becoming a nuisance, or injurious to the health both of the work-people and the public generally. The law should not only make it imperative that the ordinary condition of health shall be observed; it should go a step further, and restrict labor at certain ages, and regulate the hours of work.

The workshops should be well lighted, thoroughly ventilated, and, when necessary, provision should be made for the prompt removal of dust particles. The speedy removal of deleterious refuse matters and the observance of extreme cleanliness should be enjoined, and all overcrowding prevented.

Trades which produce offensive effluvia, dust, or

acrid vapors, are apt to cause nuisances which are injurious to health, or which may simply annoy or inconvenience the public. Nuisances of the latter description are subjects for action at common law. When the public health is imperilled the sanitary authorities are bound to interfere.

The workers at certain trades are liable to suffer in their health from the inhalation of solid or gaseous substances produced by the processes, unless efficient safeguards are provided. The dust in cotton and woollen mills, metallic vapors, filings and grindings, and solid particles of various kinds, when inhaled, are highly injurious. Certain gases and fumes and fetid substances also have an injurious effect, if breathed in confined apartments.

The public also are to be protected from annoyance and from injury to health resulting from the improper conduct of dangerous, noxious, or offensive trades. The businesses apt to create nuisances are very numerous, as will be seen by a reference to the classification adopted by the French Government in 1866, which may be profitably consulted. It is not expected that the inspector shall be familiar with all the details of the various trades therein specified, but he should have a general knowledge of the sources and effects of the offensive effluvia and outflow produced by certain well-known processes of manufacture, so that when complaint is made he will be able to intelligently investigate these offences and suggest the best means for their remedy. To perform this oftentimes perplexing duty it is necessary that the inspector shall possess good powers of observation, a thorough acquaintance with practical chemistry, and familiarity and experi-

mental knowledge with regard to the uses of various mechanical contrivances and the modes of testing their efficiency. It is only by close personal observation and careful investigation that reliable information can be obtained upon which to base the suggestions of remedies. Suggestions should not be made without extreme caution, and in no case unless there is a strong probability of a successful result. In some few special cases it may be necessary to employ the services of an expert who has greater familiarity with the questions at issue.

With proper precautions, offensive trades and manufactures can be conducted without causing a nuisance. Whenever advantageous and practicable, foul refuse matters should be utilized; but if this cannot be done, other means should be employed for their disposal without causing a nuisance by contaminating either air, soil, or water. Foul matters awaiting disposal should be stored in closed tanks or receptacles. Suitable receptacles with tightly-fitting covers should also be used for removing such matters. Dangerous or offensive gases or vapors should be intercepted and rendered harmless and inoffensive by the use of proper condensers, or scrubbers, or of absorbents, or by combustion in the furnace-fires. A combination of these various means may often be advantageously adopted. All offensive processes, such as fat-rendering, bone-boiling, etc., should be conducted in steam-tight tanks, and the vapors given off should be passed through condensers, and such fetid matters as may not be removed should be consumed in the furnace-fires.

The inspection of mines, and the storage and sale of explosive and poisonous substances, etc., are gener-

ally regulated by State laws, and do not require the special attention of the sanitary inspector.

Sanitary Inspection of Public Schools.—The sanitary supervision of schools is an essential part of the administration of every well-ordered system of public education. The object of such supervision is the protection and preservation of the health of the children by securing proper sanitary arrangements of the school buildings, the observance of the laws of health, the enforcement of regulations for the prevention of the spread of contagious or infectious diseases, and by practical instruction in the plain rules of hygiene.

The surroundings in which the child passes the first years of its life should conduce to its healthy development and not impede it, as is so often the case in a large number of our schools. The aim of modern education should be to foster the physical as well as the intellectual and moral development of the child, not only for the advantages of health itself, but also for the sake of establishing a sound physical basis, without which true progress in the culture of the intellect is impeded or prevented.

When the State assumes the responsibility of educating the children, it also obligates itself to carefully guard their health, both physical and mental. This obligation is due to the public who entrust the care and training of their children to others during a large portion of their lives. The State should not be content simply to "hold physical childhood unharmed while mental childhood is getting its schooling;" it should strive to promote physical health and vigor as an indispensable accompaniment to intellectual training, in order to make public education an important

measure of public economy as well as a powerful moral agency.

As a means of promoting these objects, the aid of sanitary and medical science must be invoked in the adaptation of the school buildings for healthful occupancy, in supervising the hygiene of the premises and the hygienic care of the children, in preventing the spread of contagious or infectious diseases, in regulating the programme of studies, and in imparting practical notions of hygiene and sanitary laws.

The selection of the site, the construction, heating, lighting, ventilation, water-supply, and drainage of the school buildings, and the details of arrangement and management of the buildings and appurtenances, must be in conformity with the principles of sanitary science. The arrangement and adaptation of light and of the school desks and seats, according to the requirements of hygiene and the special needs of the children, are most important considerations. Mental application should be carefully proportioned to the capacity of the child; it should be neither too taxing nor too prolonged, and should be alternated with recesses and physical exercise in the fresh air.

The best constructed buildings may be rendered unhealthy, and the most perfect sanitary appliances and arrangements may become inoperative, by the neglect of those in charge. Hence it is necessary that the sanitary supervision of the buildings and appurtenances shall be entrusted to qualified officers, who shall be responsible for everything pertaining to the hygienic management of the institutions.

Sanitary supervision is an effectual means of preventing the spread of contagious diseases in, and by

means of, schools. The medical inspector, aided by the teachers (who should be instructed how to recognize the premonitory symptoms of contagious diseases), will take advantage of early information of the appearance of suspicious symptoms in any child, by sending the child home at once for his further observation, and treatment if necessary. If the disease be infectious, any other children in the family, though well, must not be permitted to attend school until the cure is complete and all danger from infection has passed.

No child should be allowed to enter the public schools who has not been vaccinated. The medical inspector should determine the evidence of satisfactory vaccination.

A close observation of the children will enable the inspector to determine whether any injury to health is liable to happen, by reason of constitutional disease or weakness, from the course of study or discipline, and advise such modification as the case may require. Children predisposed to consumption, scrofula, lymphatic disease, anæmia, etc., should be the objects of the greatest solicitude of both teacher and physician while under their care.

Besides the provision of favorable surroundings, fresh air, light, proper temperature, etc., special attention should be given to the personal hygiene of the children, to their clothing, proper cleanliness, exercise, and the regulation of studies so as not to overtax and fatigue the organs of the child.

The medical inspector should have a ready faculty for teaching, as his position will enable him to speak with authority and effect, and to utilize the many op-

portunities afforded for instructing the children in the elementary principles of hygiene, by means of examples coming under their own personal observation. He should describe to them the dangers from the use of alcoholic drinks and tobacco, the ill effects of want of ventilation and uncleanness, the reasons for isolating infectious diseases and for the practice of vaccination, the improper use of clothing, either too warm or too thin, the effects of improper attitudes, the causes of near sightedness, etc. Occasional instruction of this kind will be most serviceable in impressing the lessons in hygiene which should form a part of the regular course of instruction, and in diffusing throughout the community a knowledge of sanitary laws.

Systematic records should be kept with the use of suitable blanks, of the results of medical inspection, which should be summarized and presented, with deductions and recommendations, monthly or oftener, if necessary, to the board of health or the body having sanitary jurisdiction over the schools, and to the superintendent of public instruction. These blanks will provide for a complete descriptive list, including medical observations of each pupil who enters the school, upon which list entries may be made from time to time, at least once in each year. There should also be kept a record of diseases, accidents, and indisposition occurring at school during the month, with particular notice of cases of contagious diseases, and statistical information with regard to the premises, embracing notes on the cleanliness of rooms, school furniture, heating and ventilation, thermometric records, lighting, condition of water-closets, urinals, yards, dressing-rooms, etc. Reports should also be

made of sanitation and hygienic improvements proposed, and of the matters of personal hygiene which have been the subjects of familiar instruction.

A most complete system of medical inspection of public schools was inaugurated in the city of Brussels, Belgium, in 1874, and has been in successful operation ever since. The thirty-three public schools of that city are subject to regular medical inspection, performed by five medical officers, who devote their whole time to this work. They have the entire sanitary supervision of the schools and buildings, and the watch-care over the health of the children, and, under special circumstances, the treatment of cases of sickness.

The service includes within its scope a consideration of faults in construction, heating, ventilation, lighting, size of class-rooms, seats, desks, windows, etc.; the temperature and the daily condition of the air and the causes tending to vitiate it; physical exercise, swimming lessons, and instructive excursions; the care of the eyes, ears, teeth, skin, and body; accurate records of conditions of health determined by physical examination, and the adaptation of studies and discipline to the capacity of the child; careful training of children under the normal standard of health, and measures for preventing the spread of contagious or infectious diseases, including vaccination and revaccination; and proper sanitary instruction, so that the schools shall be the means of diffusing among the people a knowledge of the laws of health.

Sanitary Inspection of Hospitals and Public Charities.—The government of hospitals and public charities is generally entrusted to boards of directors,

variously constituted, which are responsible for its proper administration. Efficient sanitary management is a primary consideration, and in securing this object valuable aid is derived from the counsel of the medical officers, who, by education and special facilities for observation, know best the wants, the necessities, and the failings of the institutions with which they are connected, and are therefore competent to speak with authoritative advice on questions pertaining to their sanitation.

Independent of these provisions for responsible government, the State or local authority should have the assurance of the faithful and efficient administration of its delegated powers which periodical investigations will afford, and, among other things, should take cognizance of the sanitary condition of these institutions, either through the State or local health boards, according as they fall under the jurisdiction of the one or the other.

Sanitary inspections should be made periodically, and the results recorded for future reference and use. The primary surveys will necessarily embrace a large number of inquiries, many of which, if satisfactorily answered, need not be made again; the subsequent inspections being confined to conditions liable to variation, and which depend on various contingencies. Much of the information required, such as details of construction, cubic air-space, plans of drainage, ventilation and heating, statistical data, etc., will be available from reliable records preserved by the institutions, so that the inquiries will be directed more especially to the adaptation of the buildings to their uses, the efficiency of the sanitary arrangements, the salubrity of

locality, the sanitary condition and management of the buildings and premises, and the management of contagious diseases.

The special points to be inquired into are: The location, nature of the soil, area of grounds, drainage arrangements, materials of construction of buildings, number of stories, floor plans, number and size of wards, floor room per bed in wards, cubic space per bed, mode of heating and ventilation, position of water-closets, urinals, etc., and their ventilation, provisions against fire, fire-escapes, amount and quality of food, water-supply, overcrowding, prevalence of hospital zymotic diseases, as erysipelas, pyæmia, etc., contagious diseases and their management, disinfection, presence of endemic influence, hygiene of the buildings and premises, and rules, regulations, and statistics on sanitary subjects.

The results of inspection should be recorded in proper form for use in furthering the ultimate objects of the investigation.

Sanitary Inspection of Police and Prisons.—Oversight in all matters of concern to health in these departments should be exercised by the proper sanitary authorities. The station-houses of the police department will require occasional inspection, in order to insure the application of necessary hygienic measures. The buildings should be expressly adapted to their uses, and all necessary appointments should be made for the health and comfort of the officers, and for the decency, convenience, and cleanliness of the prisoners. The air-space per head for the average occupancy of the cells should conform to a standard. Special attention should be given to the ventilation, heating, privy ar-

rangements, and cleanliness of the cells, and also to the facilities for personal cleanliness.

Arrangements should be made for prompt surgical and medical attendance, at all hours, upon cases of injury or sickness, and for the immediate examination of suspected cases of contagious or infectious diseases brought in from the street, so that persons suffering from dangerous communicable diseases may be transferred to the proper hospital, and the cleansing, disinfection, and fumigation of the apartments executed with despatch.

An ambulance system in connection with the police department, for conveying the sick and injured to hospital, should be organized and conducted under medical supervision. The regular and systematic instruction of the police force in the manner of rendering first aid to the sick and wounded is a humane requirement, which should be carried out under competent medical direction.

The sanitary inspection of prisons should be carried out upon the general plan suggested for hospitals and public charities. Special attention should be directed to the cubic air-space per head of occupancy of the cells, to the ventilation, heating, and privy arrangements of the apartments, to the cleanliness of the prisoners, and to the means at hand for checking the spread of contagious diseases. Every well-ordered prison should have an isolated building or apartment for the treatment of these diseases, to which all cases at their inception should be removed, if they cannot be at once transferred to the town hospital for contagious or infectious diseases.

The medical inspection of houses of prostitution, in

aid of the suppression of one of the worst forms of human disease, must be conducted under the provisions of special laws upon the subject.

Sanitary Inspection of Fire Establishments.—Fire establishments should be included among the institutions subjected to sanitary supervision. The hygienic condition of the premises, water-closet accommodations, facilities for bathing, and the manner of berthing and subsisting of the men are the chief points of inquiry.

Medical attendance should be provided for the sick and disabled. Suitable apparatus for the rescue of life endangered by fire should be distributed over the town, and be under the immediate control of the fire or police department. The inquiry should also be extended to the provisions made for the erection of fire-escapes, and for the inspection of illuminating oils, and the storage of explosives

Sanitary Inspection of Cemeteries and Burial.—The disposal of the dead without injury to the living is a question of the greatest interest to a community. Cremation, a process by which bodies can be rapidly, completely, and inoffensively disposed of, solves the problem to the satisfaction of hygienic laws, but the practice is in its incipiency. The common mode of burial by interment requires the strictest sanitary regulation. The location of burial-grounds should be determined only after the most careful inquiry into the sanitary features of the question, and a full consideration of the future, as well as the present, needs of the community. Intramural interment, being in conflict with the laws of health, should be interdicted.

In locating cemeteries the site, character of the soil,

facilities for drainage, direction of the ground-water, and distance from inhabited places are prominent considerations. The site should be elevated, so as to afford good ventilation and ample drainage; and it should be well planted with shrubs and trees, in order that the roots may absorb and utilize the products of decomposition. The soil should be dry, and the ground-water never permitted to rise into the graves or vaults. When necessary, artificial drainage should be employed to prevent the accumulation of water in the soil. The drainage should not be allowed to flow into any water-course from which drinking-water is obtained; nor should the flow of the ground-water be toward inhabited places which depend on wells for their water-supply. When there is a choice, a loose, marly soil should be selected, as it permits of free movement of air and water, conditions which are essential to speedy decomposition. Gravelly soils are not so good, but they are preferable to stiff clays, which tend to retard the process of decay.

The decomposition of bodies takes place by putrefaction with the evolution of effluvia. The products of decomposition are arrested or changed by the earth. Under certain conditions the volatile substances generated by putrefaction may escape into the air, and hence the air over graveyards is liable to contamination. Saponification may take place when the earth about bodies is dense, and becomes saturated with the products of decomposition.

The time required for the decay of bodies varies according to the nature of the soil, the access of air, pressure, etc. Ordinarily, in a loose, marly soil the process may be completed in three or four years, but

in other soils of a less favorable character it may be very slow, thirty or more years being required for effecting a complete disintegration. Before interfering with an old graveyard a sufficient time should be allowed to elapse, after the discontinuance of all interments, to insure the complete destruction of the remains. Deep burial is to be preferred, and not more than one body should be placed in a single grave. The earth should come in contact with the coffin, in order to hasten decomposition. The use of strong outer cases is objectionable, as it prolongs the process of decay.

The vicinity of cemeteries is not considered salubrious, owing to the danger of contamination of the air and water, and the escape of the effluvia from frequent disturbance of the soil saturated with the products of putrefaction. Most foreign governments prescribe the least distance allowable between graveyards and dwellings; but in the United States there is no general regulation on the subject. Under ordinary circumstances the distance should be at least five hundred feet.

It is customary among the poor to keep the bodies of their deceased friends for days in the same room in which the family live and sleep. Such a practice cannot be otherwise than detrimental to health. In order to avoid the necessity for such detention, mortuaries should be provided in every city and town, where, in these cases, all corpses could be removed at a reasonable time after death has taken place. Burial should not be delayed for more than three or four days, and in hot weather and in all cases of infectious disease the interment should promptly take place. Another

advantage of mortuaries is the means they afford of lessening the expenses of the funeral, a point of great significance to those in humble life.

No interment should be permitted without a permit from the board of health, issued over a certificate of death from an authorized person; nor should any grave be disturbed, nor any body be removed into or out of any place, without official authorization.

Special care is required in the management of the bodies of those who have died of contagious or infectious diseases. In such cases public funerals should be absolutely prohibited, and the interment should take place without needless delay.

Vigilant inspection is essential to the efficient administration of the laws and regulations pertaining to cemeteries and burial. This duty may be imposed upon the sanitary inspector, or an officer specially appointed by the board of health, which body should have the power to make rules for the proper disposal of the dead.

Sanitary Inspection in Cases of Contagious or Infectious Diseases.—The prompt notification of cases of dangerous communicable disease is a duty generally imposed by law upon the medical attendant, and its neglect is made punishable by fine. The object of notification is to secure the advantages of prompt investigation of the origin and causes of diseases liable to become epidemic, the discovery of the means by which they are spread, and the application of measures of prevention.

In all cases in which the disease can be spread, either directly or indirectly, from one person to another the isolation of the patient and the disinfection or destruction of the infectious material are of primary

importance. Isolation may be accomplished by removing the sick at the earliest possible moment from the house, or, in some cases, by the removal of the well, if accomplished at the outbreak of the disease. In order to carry out the former object it is necessary to have hospitals exclusively for the treatment of these cases, and special conveyances for the transportation of the patients. In crowded houses the removal of the sick is the only possible way of checking the spread of the disease, and therefore every town should have the means of isolation.

The arrest of the spread of the disease is further to be attempted by thorough ventilation and cleanliness of the sick-room, the prompt disinfection of excreta, the disinfection of bedding, clothing, and all articles in the sick-room, before their removal, and, after the recovery or death of the patient, the disinfection of the clothing, rooms, house, cesspool, etc. Disinfecting chambers should be provided by the town authorities for the immediate purification, by heat or other means, of all soiled clothing, bedding, and other infected articles that cannot be properly treated at home.

Small-pox is prevented by vaccination. Some diseases, such as typhoid fever and scarlet fever, may be propagated by the agency of contaminated water, or milk, or other food. Epidemics have originated in this way. The origin of the disease is therefore to be inquired into, in order that measures may be intelligently employed for checking its spread.

During the prevalence of an epidemic unusual measures may be required for the public safety, such as house-to-house inspection for detecting concealed cases of disease and insuring their proper management, the

placarding of houses of the sick for preventing intercourse with them, the speedy interment of the dead, the purification of houses and premises by the public disinfector, the erection of temporary hospitals, and the publication of information for the use of the people in dealing with the emergency. The prompt recognition of the first cases of disease is of the greatest importance, as upon it will often depend the possibility of preventing its spread.

Maritime and Inland Quarantine Inspection.—For the object of preventing the introduction of contagious or pestilential diseases from one country to another, quarantine stations have been established at the ports of all civilized nations, where vessels infected or suspected of infection are subjected to sanitary inspection, in order to determine whether such vessels shall be admitted to free pratique or be detained for observation, disinfection, and the application of necessary prophylactic measures. For the same purpose the restriction of intercourse by land with places infected with dangerous communicable diseases is sometimes a necessity. Absolute isolation, or suspension of all communication with the infected place, is impracticable and unnecessary, since the risk of introducing disease from infected places can be greatly diminished, if not prevented, without stopping or retarding to any considerable extent commercial intercourse, by establishing a system of sanitary inspection of passenger trains, boats, and vehicles conveying persons or goods from such places. In foreign countries the inspection service is conducted by the national government. In this country, in the absence of a national health bureau, it would be best to have such a service organized

under the State boards of health, and practised on the frontier, on the lines of travel from the seaboard to the West, and in the vicinity of the infected locality. By concerted action between the State authorities, and with the co-operation of the National Government, the means necessary for restricting or suppressing epidemic disease can be most effectually carried out. Such action would be a guarantee of protection of the public health, which would prevent panic and demoralization, and disastrous obstructions of commerce, and the stoppage of trade and travel.

The efforts made to protect the Mississippi Valley against yellow fever, and the West and Northwest against small-pox, by a system of sanitary inspection maintained by the National Government, and carried out along the lines of travel without embarrassing commerce or travel, have been attended with the best results, and prove the value of this service. The stream of immigration which pours into the great Northwest direct from the seaports of the country has made advisable, during the prevalence of dangerous infectious diseases at the ports of embarkation, the establishment of inspection stations at the railway centres along the lines of travel, for the examination of immigrants who may have developed the infection after leaving the seaboard, and for the inspection of baggage and the vaccination of the unprotected.

The inspectors employed for this duty should derive their authority from the National or State Governments, and, in order to facilitate their labors, they should seek the co-operation of local boards of health and of the railway and transportation officers. Provision should be made for the isolation, care, and

treatment of the sick, and for the detention and isolation of suspected cases; for the ready use of disinfectants, the cleansing and disinfection of cars and boats, and for the disinfection of the clothing and baggage of the passengers. If the disease is small-pox, all unprotected persons who have been exposed to the contagion should be vaccinated; if they refuse to be vaccinated, they should be turned back, unless exempted for good or sufficient reason. The examination should include all parts of each vessel and train, and each passenger and all baggage, etc.

It is important to know the place from which the passengers have come, and the destination of any persons suspected of conveying or harboring a dangerous communicable disease. All bedding, wearing apparel, or other articles liable to contain infection, arriving from suspected places, should be unpacked and disinfected before being allowed to proceed. When practicable, special provision should be made for the disinfection of clothing in cars while on the route.

The sanitary condition of the cars should be inquired into, and the quality of the drinking-water and the ice used in it closely scrutinized. If from any cause it is unsatisfactory, the fact should be noted, and steps taken for its immediate improvement. The inspecting officers should make frequent reports to the authorities under which they act, and should communicate to local and State health-boards any facts coming within their knowledge which may be of advantage in preserving the public health. Publicity should be given to the objects and requirements of the service, in order to enlist co-operation and prevent needless attempts to evade the law.

The sanitary inspector, in whatever line of duty employed, should form the habit of taking accurate notes of the particulars of his examinations, and of the action taken in each case. These notes will form the basis of more permanent records, and of reports which he will be required to make, from time to time, to the sanitary authorities. The notes should be terse but clear, and they should embody a condensed statement of pertinent observations and recommendations. In order to systematize and render less onerous the work of record-keeping, printed forms containing the subjects of inquiry should be made use of. These forms, with the observations legibly written in ink, if bound, paged, and indexed—a plan advised in making a sanitary survey of a town—will make a valuable record for future reference.

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